PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Koji Mishima et al.
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For	:	OPTICAL RECORDING MEDIUM
	Examiner	: Martin J. Angebranndt
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Mail Stop Appeal Brief - Patents
Commissioner for Patents
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APPELLANTS' BRIEF

Commissioner for Patents:

This brief is in furtherance of the Notice of Appeal, filed in this case on May 13, 2008. The fees required under Section 41.20(b)(2), and any required request for extension of time for filing this brief and fees therefor, are dealt with in the accompanying transmittal letter.

I. REAL PARTY IN INTEREST

TDK Corporation is the assignee of the present application and is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF CLAIMS

Claims 17-27, 29 and 31 are pending. Claims 1-16, 28 and 30 are canceled. Claims 17-27, 29 and 31 were rejected in the Final Office Action mailed December 20, 2007. The rejections of claims 17-27, 29 and 31 are appealed.

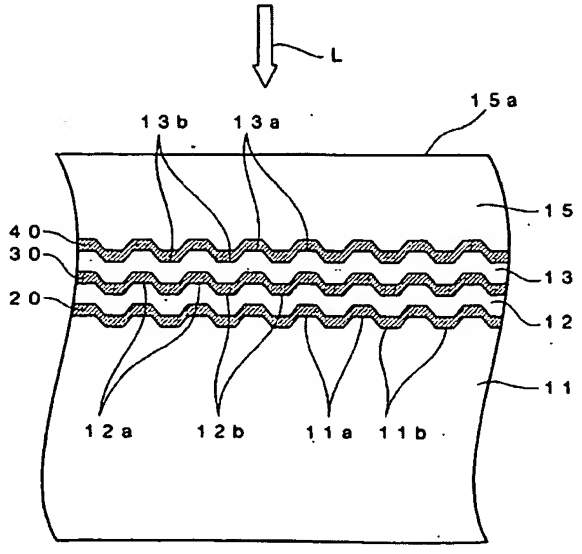
IV. STATUS OF AMENDMENTS

An amendment to claim 17 was proposed in a Response filed April 16, 2008 after the Final Office Action. The Examiner denied entry of this amendment in an Advisory Action mailed April 21, 2008. Therefore, the language of claim 17 on appeal does not reflect this amendment.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The inventions claimed herein relate to optical recording media, and, in particular, to optical recording media comprising a plurality of recording layers. Such optical recording media often present a challenge in that the composition of those recording layers other than the recording layer farthest from the light incidence plane (*e.g.*, the recording layers 30 and 40 in Figure 2 below, excerpted from the specification) (hereinafter, "shallow recording layers") must balance two competing concerns. First, the shallow recording layers should have a sufficiently high light transmittance to allow recording data in and reproduction of data from the recording layer farthest from the light incidence plane (*e.g.*, recording layer 20 in Figure 2 below). Meanwhile, the shallow recording layers should also produce a sufficiently large difference in reflection coefficients between a region having a record mark and a blank region to yield an adequate carrier-to-noise (hereinafter, "C/N") ratio.

FIG.2



The present application describes an optical recording medium having multiple recording layers, which, in certain embodiments, effectively balances the needs of high light transmittance and high C/N. The following discusses independent claim 17, with reference numerals from Figure 2 in brackets. The information in the parentheses below provides specific page and line references to at least some of the example embodiments corresponding to the elements recited in the claim. Of course, the reference numerals and parenthetical information are illustrative only and are not intended to limit the claim only to the exact embodiments shown and described in the specification and figures.

Claim 17 recites:

An optical recording medium comprising a substrate [11] (Specification at p. 18, ll. 10-14), a light transmission layer [15] (Specification at p. 18, ll. 10-14), and a plurality of recording layers [20, 30, 40] (Specification at p. 18, ll. 10-14) laminated via at least intermediate layers [12, 13] (Specification at p. 18, ll. 10-14) and disposed between the light transmission layer and the substrate (Specification at p. 18, ll. 10-14), the recording layers constituted so that a laser beam [L] is projected onto the plurality of recording layers via the light transmission layer (Specification at p. 18, ll. 19-22), at least one of the recording layers other than a recording layer farthest from the light transmission layer among the plurality of recording layers [30 or 40] containing at least one element M selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La (Specification at p. 124, ll. 14-26), at least one element selected from a group consisting of S, O, C and N as a primary component (Specification at p. 124, ll. 14-26 – note that the "element X" described therein is further clarified at p.11, ll. 7-9), and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti (Specification at p. 124, ll. 14-26),

wherein the at least one recording layers [30 or 40] contains the elements selected from a group consisting of S, O, C and N and the at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti in a form of a compound thereof (Specification at p. 31, l. 18 to p. 32, l. 3), and

wherein the at least one recording layers [30 or 40] is constituted so that information is recorded therein upon being irradiated with the laser beam (Specification at p. 18, l. 27 to p. 19, l. 13).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 17-27, 29 and 31 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claims 17-27, 29 and 31 also stand rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement.

Claims 17-25 and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent no. 6,033,752, issued to Suzuki *et al.* (hereinafter, "Suzuki"), and U.S. patent no. 4,405,706, issued to Takahashi *et al.* (hereinafter, "Takahashi"), in view of Japanese publication no. JP 54-133134, to Yoshiyuki (hereinafter, "Yoshiyuki").

Claims 17-27 and 31 also stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Suzuki and Takahashi, in view of Yoshiyuki, and further in view of U.S. patent no. 4,682,321, issued to Takaoka *et al.* (hereinafter, "Takaoka") or Japanese publication no. JP 2003-054135, to Mizushima *et al.* (hereinafter, "Mizushima") combined with U.S. patent application publication no. 2004/0018334, to Nee (hereinafter, "Nee") and U.S. patent no. 5,871,881, issued to Nishida *et al.* (hereinafter, "Nishida").

Claims 17-27, 29 and 31 stand further rejected under 35 U.S.C. § 103(a) as being unpatentable over Suzuki and Takahashi, in view of Yoshiyuki, and further in view of Takaoka or Mizushima combined with Nee and Nishida, combined with U.S. patent application publication no. 2001/0021160, to Shuy *et al.* (hereinafter, "Shuy").

VII. ARGUMENT

A. Rejection of Claims 17-27, 29 and 31 under 35 U.S.C. § 112, Second Paragraph

Claim 17 recites, *inter alia*, "at least one recording layers contain[ing] the elements selected from a group consisting of S, O, C and N and the at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti in a form of a compound thereof."

The Examiner requested that Applicants clarify whether the compound described in independent claim 17 referred to "a chemical compound or compounding in the general sense." Office Action of December 20, 2007, p. 2. It is submitted, however, that this language of claim 17 is not indefinite on its face, and especially not in light of the content of the specification as filed. *See* M.P.E.P. § 2173.02.

A person of ordinary skill in the art would understand that the elements selected from a group consisting of S, O, C and N and the at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti would be in a form of a "chemical compound," and not in a form of a mixture or some other layperson's definition of "compound." Indeed, throughout the specification, the term, "compound," is used to refer to a "chemical compound." *See, e.g.*, p. 55, ll. 23-28 ("it was reasonable to conclude that Zn was present in the form of a simple substance and a compound with S"); p. 60, ll. 13-16 ("Compounds of La and O were observed"); p. 125, ll. 13-14 ("thereby forming a crystal of a compound of the element X with the metal M"). A person of ordinary skill in the art reading claim 17 would therefore understand the term "compound" to be synonymous with the phrase: "chemical compound."

Claims should be allowed "which define the patentable subject matter with a reasonable degree of particularity and distinctness . . . [and the Examiner should not] insist on [his] own preferences if other modes of expression selected by applicants satisfy the statutory requirement." M.P.E.P. § 2173.02 (emphasis added).

In light of the clarity of the language of pending claim 17, it is submitted that the Examiner's rejection of claims 17-27, 29 and 31 should be withdrawn.

B. Rejection of Claims 17-27, 29 and 31 under 35 U.S.C. § 112, First Paragraph

The Examiner rejected all of the claims for failing to have written description support for the claimed recording layer containing "the elements selected from a group consisting of S, O, C and N and the at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti in a form of a compound thereof," as recited in claim 17. It is submitted that support for this claim language can be found throughout the originally filed specification. Elements selected from the group consisting of S, O, C and N are described throughout the specification as "element X" (p. 11, ll. 7-9), and different elements from this

group are used in the different working examples. Thus, these elements are presented as substantially interchangeable components of the shallow recording layers. At p. 31, l. 18 to p. 32, l. 3, the specification provides the following example:

> Further, the second recording layer 30 having a thickness of 15 nm to 50 nm is formed on the surface of the first intermediate layer 12 by a vapor growth process such as a sputtering process using a target consisting of the mixture of ZnS and SiO_2 and a target consisting of at least one metal selected from the group consisting of Mg, Al and Ti. During the process for forming the second recording layer 30, the at least one metal selected from the group consisting of Mg, Al and Ti acts on the mixture of ZnS and SiO_2 as a reducing agent and as a result, Zn is separated from S and simple substances of Zn are uniformly dispersed in the second recording layer 30.
>
> On the other hand, although not altogether clear, it is reasonable to conclude that the at least one metal selected from the group consisting of Mg, Al and Ti combines a part of S separated from Zn or S contained in ZnS to form a compound.
>
> (Emphasis added.)

This passage, in combination with the other teachings of the originally filed specification, provides support for the compound recited in pending claim 17. It is therefore submitted that the Examiner's rejection of claims 17-27, 29 and 31 should be withdrawn.

C. Rejections of Claims 17-25 and 31 over Suzuki, Takahashi and Yoshiyuki

The Federal Circuit has held many times that to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). *See* M.P.E.P. § 2143.03 (stating that all words in a claim must be considered in judging the patentability of that claim against the prior art).

The rejection of claims 17-25 and 31 does not meet these requirements for *prima facie* obviousness, since the cited references (whether singly or in combination) do not teach or suggest all of the claim limitations of independent claim 17. Moreover, a person skilled in the relevant art would not have combined these references as suggested by the Examiner.

Cited References Fail to Show the Claimed Plurality of Recording Layers

Independent claim 17 recites, *inter alia*, an optical recording medium having a plurality of "recording layers constituted so that a laser beam is projected onto the plurality of recording layers via the light transmission layer." The Examiner states that "the claims do not require that all the recording layers be accessible from the same side." Office Action of December 20, 2007, p. 8. However, it is respectfully submitted that the plurality of recording layers recited in claim 17 are explicitly constituted so that a laser beam may be projected onto them via the same light transmission layer, not via different light transmission layers. Such an arrangement is not taught or suggested by the combination of Suzuki, Takahashi, and Yoshiyuki.

The Examiner asserts that it would have been obvious to use the recording media shown in Figure 4 of Suzuki in order to arrive at an optical recording medium having the claimed plurality of recording layers. However, Suzuki merely discloses "a double sided optical recording medium 12." Col. 9, l. 32 (emphasis added). While this double sided recording medium includes multiple recording bi-layers, these bi-layers are not constituted so that a laser beam may be projected onto them via a single light transmission layer. Instead, Suzuki's optical recording medium is **double sided** and therefore includes two light transmission layers, one for each recording bi-layer. Thus, Suzuki does not disclose, teach or suggest the claimed plurality of recording layers.

The Examiner has not provided any arguments that Takahashi or Yoshiyuki supply this teaching of a plurality of recording layers constituted so that a laser beam is projected onto the plurality of recording layers via a single light transmission layer, and it is submitted herein that neither Takahashi nor Yoshiyuki disclose, teach or suggest the claimed plurality of recording layers.

Moreover, since none of the cited references teaches the claimed plurality of recording layers, none of the cited references can be relied upon to teach the composition of at least one shallow recording layer, that is, "at least one of the recording layers other than a recording layer farthest from the light transmission layer among the plurality of recording layers." Indeed, none of the cited references discloses any such shallow recording layers.

A Skilled Artisan Would Not Have Made the Proposed Combination

The three references cited by the Examiner teach recording layers (and bi-layers) having different compositions for recording data by very distinct processes. In particular, Suzuki teaches a recording bi-layer, wherein a component of one layer (*e.g.*, $Bi/ZnS/SiO_2$) mixes or reacts with a component of another layer (*e.g.*, In) upon being irradiated with a laser beam to form an intermetallic compound or a semiconductor, thus reducing the metallic properties of one of the components. *See* col. 7, l. 62 – col. 8, l. 19. Takahashi, in turn, teaches the use of a heat mode recording layer that, when irradiated, experiences a local temperature increase, causing a thermal change such as melting cohesion or evaporation. *See* col. 1, ll. 16-26. Finally, Yoshiyuki teaches recordation by irradiating an oxidant 2 to release the oxygen therein, thereby oxidizing a metal oxide 1 and rendering the metal oxide 1 transparent. *See* Figure 2.

These inherent differences between the mixing process of Suzuki, the melting/evaporation process of Takahashi, and the oxidation process of Yoshiyuki would deter a person skilled in the art from making the combination proposed by the Examiner. The Examiner ignores the fact that each of the references discloses particular materials suitable for specific processes, and that such materials are not intended for use with one another. Indeed, a person skilled in the art would understand that there would be significant technical challenges in attempting, for example, to apply teachings regarding the use of the heat mode recording layer of Takahashi to the mixing / reactive recording bi-layers of Suzuki. A person skilled in the art might recognize that such a combination would even render Suzuki unsuitable for its intended purpose, i.e., recording via the disclosed mixing process. The Examiner fails to recognize and properly consider the technical problems with the asserted combination and simply applies hindsight reasoning to support the combination.

For at least the above reasons, it is respectfully submitted that claim 17 is allowable over the Suzuki, Takahashi, and Yoshiyuki references. Dependent claims 18-25 and 31 are also allowable over these references at least because they include the limitations of independent claim 17.

D. Rejections of Claims 17-27 and 31 over Suzuki, Takahashi, Yoshiyuki, Takaoka, Mizushima, Nee and Nishida

These rejections are respectfully traversed because the cited references fail to disclose, teach or suggest all of the elements of independent claim 17. *See* M.P.E.P. § 2143.03 (stating that all words in a claim must be considered in judging the patentability of that claim against the prior art). *Also see In re Wilson, supra.* Moreover, a person skilled in the relevant art would not have combined these references as suggested by the Examiner.

As set forth above, Suzuki, Takahashi and Yoshiyuki do not, alone or in combination, disclose a plurality of recording layers constituted so that a laser beam is projected onto the plurality of recording layers via a single light transmission layer. Therefore, these references cannot be understood to supply any teaching regarding the composition of a shallow recording layer. Even if more recording layers were added in accordance with the additional references cited by the Examiner, such additional recording layers cannot supply this missing teaching of Suzuki, Takahashi and Yoshiyuki.

Additionally, Suzuki, Takahashi and Yoshiyuki are not properly combinable in light of the significant and fundamental technical differences between these references. The additional references cited by the Examiner do not provide any additional reason or motivation that would lead a person skilled in the art to disregard such technical differences and combine Suzuki, Takahashi and Yoshiyuki.

For at least the above reasons, it is submitted that independent claim 17 is allowable over Suzuki, Takahashi, Yoshiyuki, Takaoka, Mizushima, Nee and Nishida. Dependent claims 18-27 and 31 are also allowable over these references at least because they include the limitations of independent claim 17.

E. Rejections of Claims 17-27, 29 and 31 over Suzuki, Takahashi, Yoshiyuki, Takaoka, Mizushima, Nee, Nishida and Shuy

These rejections are traversed because Shuy does not provide teachings that remedy the above-described defects in the obviousness rejections over Suzuki, Takahashi, Yoshiyuki, Takaoka, Mizushima, Nee and Nishida. Thus, it is submitted that independent claim 17 is allowable over these references. Dependent claims 18-27, 29 and 31 are also allowable over these references at least because they include the limitations of independent claim 17.

Respectfully submitted,
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VIII. CLAIMS APPENDIX

17. (Previously Presented) An optical recording medium comprising a substrate, a light transmission layer, and a plurality of recording layers laminated via at least intermediate layers and disposed between the light transmission layer and the substrate, the recording layers constituted so that a laser beam is projected onto the plurality of recording layers via the light transmission layer, at least one of the recording layers other than a recording layer farthest from the light transmission layer among the plurality of recording layers containing at least one element M selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La, at least one element selected from a group consisting of S, O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti,

wherein the at least one recording layers contains the elements selected from a group consisting of S, O, C and N and the at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti in a form of a compound thereof, and

wherein the at least one recording layers is constituted so that information is recorded therein upon being irradiated with the laser beam.

18. (Previously Presented) An optical recording medium in accordance with Claim 17, wherein all of the recording layers other than the farthest recording layer from the light transmission layer among the plurality of recording layers contain at least one element selected from the group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from the group consisting of S, O, C and N as a primary component, and at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti,

wherein the at least one recording layers contains the elements selected from a group consisting of S, O, C and N and the at least one metal different from the element M and selected from the group consisting of Mg, Al and Ti in a form of a compound thereof, and

wherein the at least one recording layers is constituted so that information is recorded therein upon being irradiated with the laser beam.

19. (Previously Presented) An optical recording medium in accordance with Claim 18, wherein all of the recording layers other than the farthest recording layer from the light transmission layer are formed in such a manner that the recording layers closer to the light transmission layer are thinner.

20. (Previously Presented) An optical recording medium in accordance with Claim 17, wherein the recording layer containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

21. (Previously Presented) An optical recording medium in accordance with Claim 18, wherein the recording layer containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

22. (Previously Presented) An optical recording medium in accordance with Claim 19, wherein the recording layer containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S,O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

23. (Previously Presented) An optical recording medium in accordance with Claim 20, wherein the recording layer containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing a mixture of ZnS and SiO_2 or a mixture of La_2O_3, SiO_2 and Si_3N_4 as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

24. (Previously Presented) An optical recording medium in accordance with Claim 21, wherein the recording layer containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing a mixture of ZnS and SiO_2 or a mixture of La_2O_3, SiO_2 and Si_3N_4 as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

25. (Previously Presented) An optical recording medium in accordance with Claim 22, wherein the recording layer containing at least one element selected from a group consisting of Ni, Cu, Si, Ti, Ge, Zr, Nb, Mo, In, Sn, W, Pb, Bi, Zn and La and at least one element selected from a group consisting of S, O, C and N as a primary component, and at least one metal different from the element M and selected from a group consisting of Mg, Al and Ti is formed by a vapor growth process using a target containing a mixture of ZnS and SiO_2 or a mixture of La_2O_3, SiO_2 and Si_3N_4 as a primary component and a target containing at least one metal selected from a group consisting of Mg, Al and Ti as a primary component.

26. (Original) An optical recording medium in accordance with Claim 19, which comprises a first recording layer, a second recording layer and a third recording layer on the substrate in this order and the first recording layer, the second recording layer and the third recording layer are formed so that the second recording layer has a thickness of 15 nm to 50 nm and that a ratio of the thickness of the third recording layer to the thickness of the second recording layer is 0.40 to 0.70.

27. (Original) An optical recording medium in accordance with Claim 19, which comprises a first recording layer, a second recording layer, a third recording layer and a fourth recording layer on the substrate in this order and the first recording layer, the second recording layer, the third recording layer and the fourth recording layer are formed so that the second recording layer has a thickness of 20 nm to 50 nm, that a ratio of the thickness of the third recording layer to the thickness of the second recording layer is 0.48 to 0.93 and that a ratio of the thickness of the fourth recording layer to that of the second recording layer is 0.39 to 0.70.

29. (Original) An optical recording medium in accordance with Claim 17, wherein the recording layer farthest from a light incidence plane among the plurality of recording layers includes a first recording film containing Cu as a primary component and a second recording film containing Si as a primary component.

31. (Original) An optical recording medium in accordance with Claim 17, wherein the plurality of recording layers are constituted so that data can be recorded therein and data can be reproduced therefrom using a laser beam having a wavelength of 380 nm to 450 nm.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.